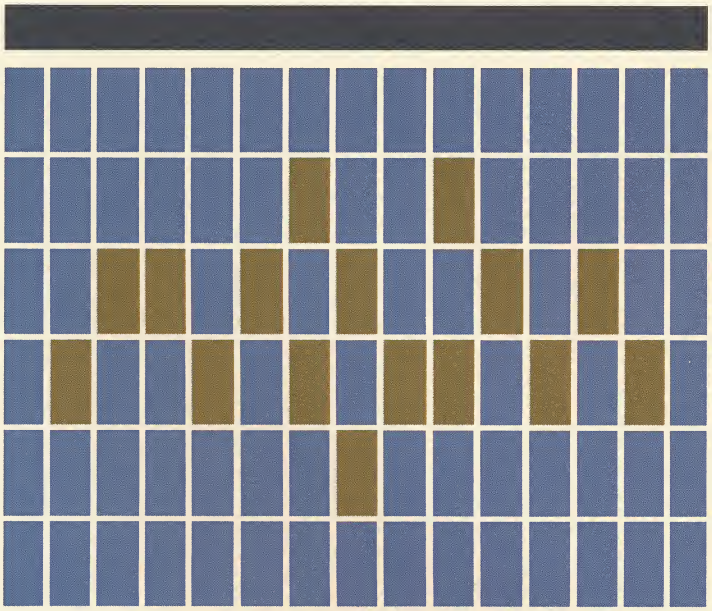
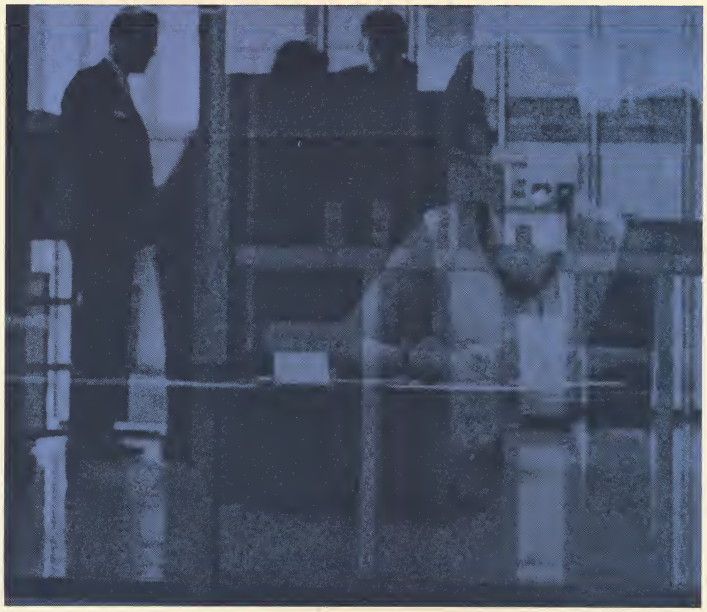
COMPUTER SCIENCES CORPORATION

CAPABILITIES





COMPUTER SCIENCES CORPORATION

CAPABILITIES

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650
AEROSPACE CENTER
COMPUTER SCIENCES CORPORATION

THIS IS CSC

Since its inception in 1959, Computer Sciences Corporation has become a principal source for development and implementation of programming systems for scientific, military and commercial applications. CSC has performed services for several hundred of the nation's largest computer users and for virtually every major manufacturer of electronic data processing equipment. On the basis of number of projects completed; total volume of business, financial responsibility or any other meaningful measure, CSC leads its field.

CSC's accomplishments cover a broad spectrum of activity from studies in trajectory analysis and orbit determination to the development of a large command and control system for space flight operations; from the design and implementation of multi-machine compilers to the development of complete integrated systems for several computers, and from the preparation of computer programs for inventory control and cost accounting to the development of complex management information systems for industry and the military.

Management at CSC is known for its outstanding technical leadership. Officers, Division and Department Managers include several former presidents of leading corporations in the information sciences and managers of major computer installations.

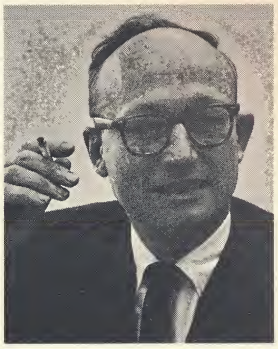
CSC's professional staff of senior specialists offers a level of experience and education rated as the highest of any comparable organization in the information sciences. Senior members of the staff average over eight years of professional experience and include senior analysts, physicists, mathematicians and engineers at the Ph.D. level.

At the CSC Service Bureau, a $3.3-million computing system employs the industry's most advanced programming system. With the recent introduction of a remote, on-line communications system, CSC offers the fastest, most efficient service presently available to customers throughout the country.

CSC offices are located in Los Angeles, New York, Houston, Washington, D. C., San Francisco and London.

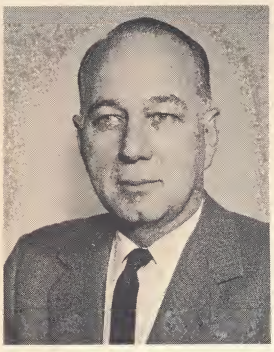
MANAGEMENT AT CSC

FLETCHER JONES, President. One of the founders of CSC in 1959, Mr. Jones was previously associated with North American Aviation for seven years.



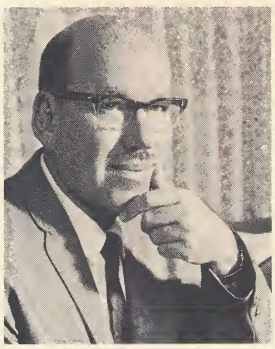
DAVID LAYSER, Vice President-Finance. Mr. Layser was previously associated with Hiller Aircraft as treasurer. His background includes more than ten years in financial management.

WILLIAM R. HOOVER, Vice President. Mr. Hoover was formerly with the Jet Propulsion Laboratory for ten years, his last position being Chief of Computer Applications and Data Systems.

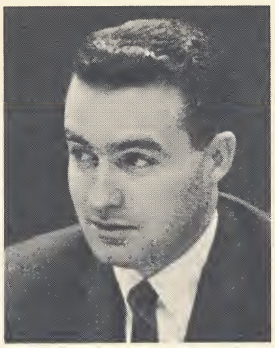


GENERAL ROY H. LYNN, Vice President. General Lynn has been President of ITT Communication Systems since 1959. He was formerly Vice Commander of the Air Defense Command.

ROY NUTT, Vice President. Co-founder of CSC, Mr. Nutt was formerly supervisor of computer systems programming research and development for United Aircraft Corporation.

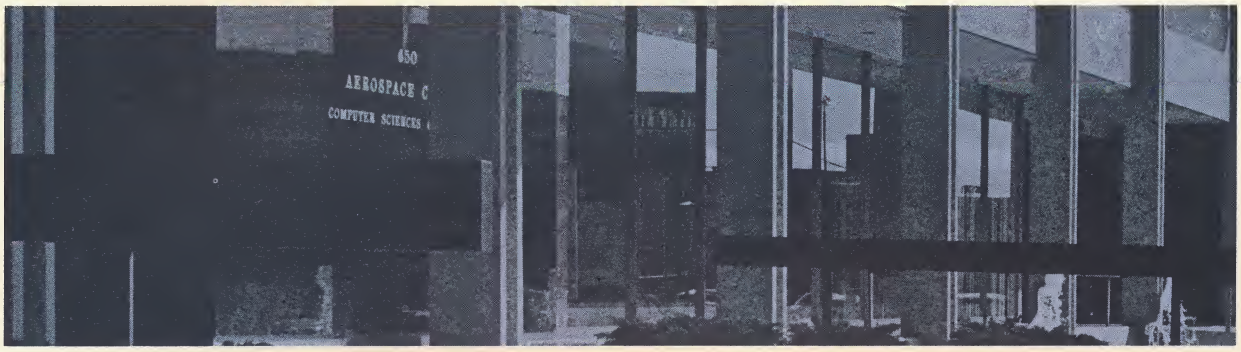


JACK STRONG, Assistant to the President. A 20-year veteran in the industry, Mr. Strong has held supervisory positions in all areas of North American Aviation's computing facilities.



VINCENT R. GRILLO, JR., Manager, Plans & Programs. Mr. Grillo was formerly founder and President of Computer Dynamics Corporation. He has 13 years professional experience in information sciences.

DAN MASON, Manager, Service Bureau Division. Mr. Mason has over 12 years experience in computer center management, having initiated and managed the world's first scientific service bureau for IBM.



HAROLD LEONE, Manager, Houston. Mr. Leone has more than 15 years experience in the computing field. He was formerly Manager of Programming Operations for General Electric.

ELDON C. DODGE, Manager, San Francisco. With more than 15 years professional computer experience, Mr. Dodge was previously employed by General Electric, Philco and Stanford Research Institute.

DR. DAVID C. STEER, Manager, London. Dr. Steer has nine years experience in computing and was previously with California Research Corporation and Proctor and Gamble.

DR. STEWART E. FLIEGE, Manager, Washington office. Dr. Fliege has nine years managerial experience on such systems as SAGE, BUIC, DODDAC and SATIN.

KEITH REDNER, Manager, Scientific Applications. Mr. Redner has an extensive background of ten years in scientific computer applications. He was formerly associated with Space Technology Laboratories and NASA.

DR. PAUL R. PEABODY, Manager, Mathematical Analysis Department. Dr. Peabody was formerly Supervisor of Applied Mathematics at JPL and has ten years professional experience in numerical analysis.

DR. ROBERT M. L. BAKER, JR., Associate Manager, Mathematical Analysis Department. With a background of 13 years in the space sciences, Dr. Baker was formerly with Lockheed Astrodynamic Research Center.

OWEN MOCK, Manager, Systems Programming. Mr. Moçk has been associated with computing for more than 15 years. He was formerly general supervisor of programming for North American Aviation.

JOEL D. ERDWINN, Manager, Programming Research and Development Department. Mr. Erdwinn was formerly programming system designer for Burroughs and has 8 years experience in systems programming.

ROBERT BOHRER, Manager, Commercial Applications. With over nine years professional experience in computer applications, Mr. Bohrer was formerly employed by General Electric, Honeywell, and Univac.

ROBERT PAUL, Technical Manager, Commercial Applications. Mr. Paul has more than eight years experience in programming management. He was formerly with North American Aviation.

DONALD A. JACKSON, Manager, Quality Assurance Department. A 12-year professional in the information sciences, Mr. Jackson was formerly with Aerojet General Corporation as Manager, Computing Sciences.

SERVICES AT CSC

OPERATIONAL SYSTEMS

CSC's Operational Systems Department is responsible for programs in the design and development of large scale Command and Control Systems for military and civilian agencies. As such, it serves as a focal point for total CSC capability. Staff members offer a wide range of system experience, including SAGE, BUIC, SATIN, SFOF, DASA, DODDAC, NTDS, and SAC control system.

Operational Systems provides the full range of services in the information sciences including:

- System analysis to determine subsystem design requirements
- Generation of operational specifications and system descriptions for customer approval and as design and test criteria for the computer program
- Human engineering of the man/computer program interface
- Design, production, test, and installation of utility systems needed to produce operational programs
- Design, production, test, and installation of support systems including simulated inputs and data reduction for test, training, and evaluation
- Development of programs for personnel training and evaluation to use separately or in conjunction with support systems
- Preparation of qualitative and quantitative personnel requirements associated with operational and maintenance positions involving interaction with the computer program

In performing these services, the Operational Systems Department is prepared to operate on a team basis with customer personnel to provide on-the-job-training both in management and technical implementation. A computer programming instruction capability is maintained to provide classroom training for customer personnel during the transition from total CSC project responsibility to total customer responsibility.

SCIENTIFIC APPLICATIONS

Problem definition, system planning, estimating, programming, management, and consultation in all phases of computer applications for the scientific and engineering fields are primary capabilities at CSC.

Combining advanced technical education, experience in a variety of scientific disciplines, and seniority in the computing profession, CSC offers the following services:

- Mathematical and numerical analysis
- Data systems design and programming
- Design and implementation of real-time computer systems
- Hybrid systems analysis and programming
- Operations analysis
- Computer controlled visual input

In the space sciences, CSC designed and implemented the programming system for Jet Propulsion Laboratory's Space Flight Operations Facility for real-time communications with NASA's spacecraft missions. The system provides for acquisition and analysis of data, orbit determination, and processing of correction signals.

For projects such as Surveyor, Mariner and Ranger, CSC has contributed programs for video data reduction and analysis. For Dynasoar and Apollo, CSC has designed and implemented computer solutions for lunar orbit determination and re-entry problems. At White Sands, CSC has provided real-time programming and systems checkout for radar control of a large missile tracking system.

In other areas of scientific application, CSC has performed mathematical analyses and programming in aerodynamics and thermodynamics for Sandia; piping flexibility analysis for Union Carbide; atomic energy research for Edgerton, Germeshausen & Grier; spherical heat conduction and rotational flow field analysis for Jet Propulsion Laboratory, and antenna design for Electronic Communications.

CSC has also provided computer programs in range safety studies including trajectory analysis and impact prediction for Lear-Siegler; test data reduction for Douglas Aircraft and AiResearch; copper path assembly system for Butler Publications and RCA; and implementation of the TELTRAN language including associated programming for Telemetrics.

MATHEMATICAL ANALYSIS

CSC's Mathematical Analysis Department provides a broad range of services at all levels of problem solving in the scientific, engineering, mathematical, and operations research fields.

Problem formulation and solution for the space sciences in astrodynamics, orbital mechanics, atmospheric flight mechanics and celestial mechanics are of primary concern. However, the capabilities of staff members range over the entire scientific computation field and include problem solutions in particle physics, field theory, thermodynamics, optimal resource allocation, and structural and network analysis.

Services provided by the Mathematical Analysis Department include:

- Consultation, problem isolation, formulation, and solution
- Feasibility studies, both technical and economic
- Development of mathematical models for simulation and gaming
- Original research in computational and analytical mathematics
- Astrodynamics and trajectory studies
- Supervision over computer program specification and design
- Analysis and interpretation of experimental results

CSC's capabilities in problem-solving are based on a staff of well-known and highly competent specialists with a strong history both in project management and in technical performance for such institutions as Jet Propulsion Laboratory, Lockheed Astrodynamics Research Center, Rand Corporation, Stanford Research Institute, Case Institute of Technology, and Douglas Aircraft Corporation.

CSC staff members have contributed to the development of orbit prediction and determination programs for the National Space Surveillance System and the JPL Space-Flight Operations Facility; the correction and standardization of astrodynamic constants; technical studies of proposed satellite systems; reliability studies of the Minuteman launch control system; analysis and design of a bombing navigation system for supersonic aircraft, and modeling of tradeoffs in space booster design.

SYSTEMS PROGRAMMING

Recognized throughout the industry as a leader in the design, development and implementation of programming systems, CSC has produced more compilers, assembly programs, executive systems and utility routines than any other independent company in the field. The growing acceptance of CSC's capability is based on the company's reputation for meeting maximum performance specifications.

Programs for more than 25 machines have been produced at CSC including complete, integrated systems for several computers. Compilers designed and developed at CSC are rated among the fastest in the industry creating the most efficient object code presently available. The development of FORTRAN, JOVIAL, ALGOL and COBOL compilers are principal capabilities at CSC.

Offering proven proficiency in systems programming, CSC services include:

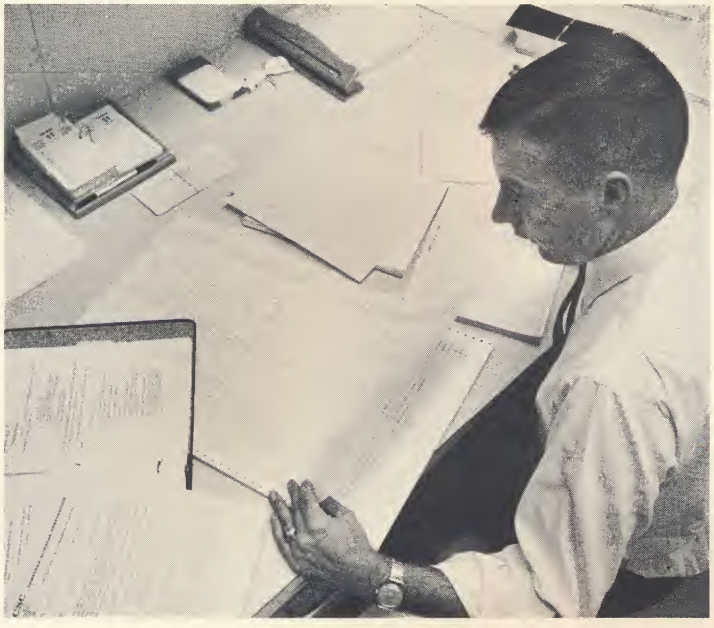
- Language development
- Scientific, business, and special-purpose compilers
- Assembly programs
- Generalized I/O programs
- Executive and monitor routines
- Sorting, debugging and utility routines
- Simulation of one computer by another
- Diagnostic and hardware checkout systems
- Communications systems programming

CSC has produced programming products for such manufacturers as IBM, Univac, RCA, Honeywell, General Electric, Philco and Librascope.

In the scientific field, CSC has designed and implemented FORTRAN compilers for the Philco 2000, Univac III, Univac 1107 and the LARC. The design of a FORTRAN/ALGOL compiler was accomplished for the RCA 601, and multi-machine compilers are presently under development for such machines as the CDC 3600, IBM 7094, Univac 490 and SDS 910.

In the business field, CSC has designed and implemented the FACT language and compiler for the Honeywell H-800, and COBOL compilers for the Philco 2000, Univac III and Univac 1107.

CSC has also produced a wide variety of monitor systems, sort/merge programs, assembly programs and report generators.



PROGRAMMING R & D

Specializing in the design, development, and implementation of computer programs well in advance of the state of the art, CSC is recognized as a principal contributor to original research in the information sciences. To help assure the highest level of technical excellence, the Programming Research and Development Department contributes as required, to any effort undertaken by the company.

A strong base of experience and accomplishment assures CSC's clients of practical solutions in problem areas on the advancing edge of programming technology. Programming R&D provides a source of talent available for the problem formulation and initial design phases of a project and for consultation during the later phases.

As supervisors, design analysts, and senior programmers, Programming R&D staff members were among the original research teams responsible for the design of many computer languages and systems in common use today. Their training and experience encompasses the entire range of mathematical, scientific and technological disciplines important to computer applications.

New advances in programming which CSC has undertaken include:

- Generalized compiler development
- List processing and symbol manipulation
- System critique and feasibility studies
- Computer oriented language definition
- Problem oriented language definition
- Multi-programming and remote processing
- Automated program documentation

Many of the results of CSC research and development have been published in leading professional journals of the computer industry. Further recognition has been awarded to CSC staff members by invitations to address national computer conferences and university seminars.

Of primary importance however, is the fact that numerous programs have been sponsored by leading computer manufacturers and major users of electronic data processing equipment as a direct result of CSC research and development.

COMMERCIAL APPLICATIONS

From cost accounting and inventory control to comprehensive management information systems, CSC capabilities cover a broad range of business applications.

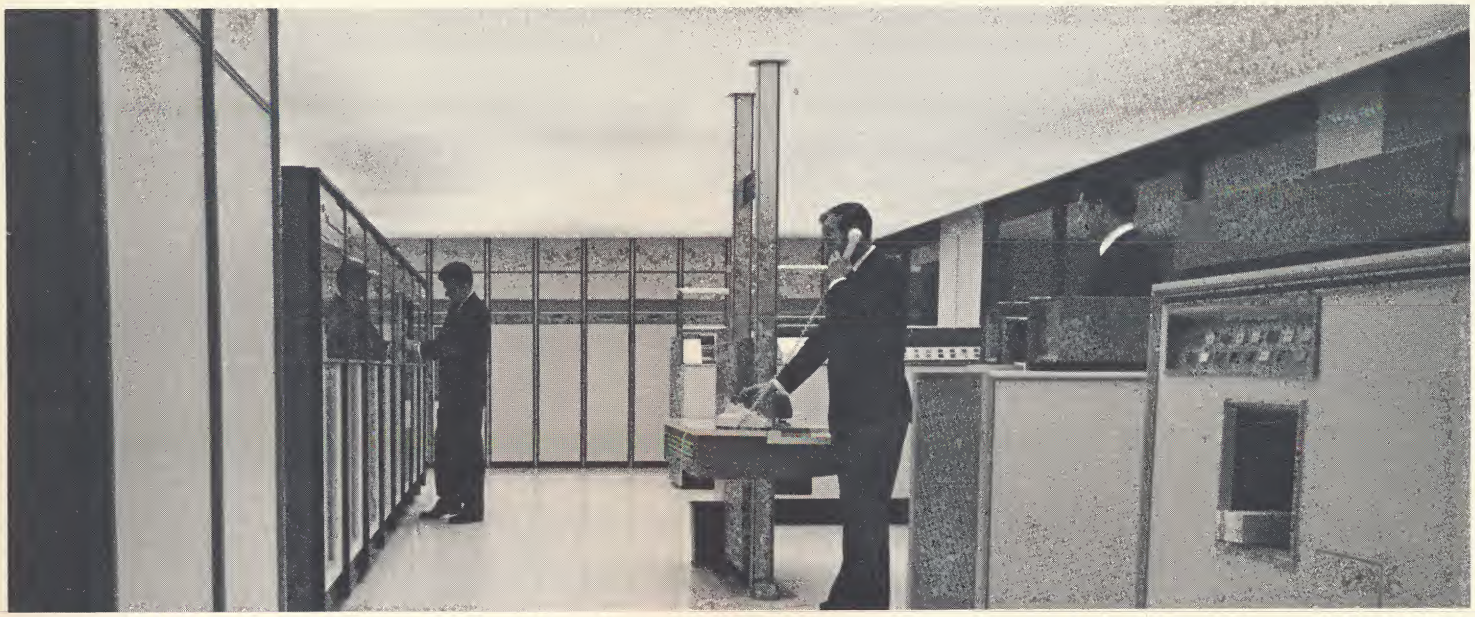
CSC staff members specializing in the commercial field have designed and implemented large scale data processing systems for such diverse industries as banking, utilities, insurance, aircraft, railroads, petroleum, retail consumer goods, and communications.

CSC's capabilities in commercial applications are based on senior professional experience at both the user and manufacturer levels as well as corporate experience in the design and implementation of major business programming systems. CSC offers the following services:

- Business systems design and analysis
- Programming of data processing systems
- Management information systems design and implementation
- Computer feasibility studies
- Conversion of manual and tabulating systems
- Critical path scheduling methods
- Hardware and software evaluations
- Development of information storage and retrieval systems

CSC has provided computer system evaluations for clients such as Joseph Magnin of San Francisco and Thompson Ramo Wooldridge; labor distribution programming for North American Aviation; design and development of cost accounting systems for Litton Industries, general ledger applications for Kaiser Aluminum, and systems analysis of military management reporting for the U. S. Air Force. For Union Oil, CSC has performed programming services in oil well production reporting, crude oil accounting and pipe line distribution.

In other areas of commercial application, CSC has developed advanced PERT/COST techniques for Douglas Aircraft, Hughes Aircraft and Edgerton, Germeshausen & Grier; developed and trained military managers in a highly advanced Life Cycle Management System for the U. S. Army Electronics Command; designed, implemented and trained customer personnel in a personnel records system for Standard Oil of New Jersey; implemented a complex management information control system for Lockheed Missiles and Space Company, and assisted in the development of inventory costing and reporting systems for Motorola and Del Webb.



SERVICE BUREAU

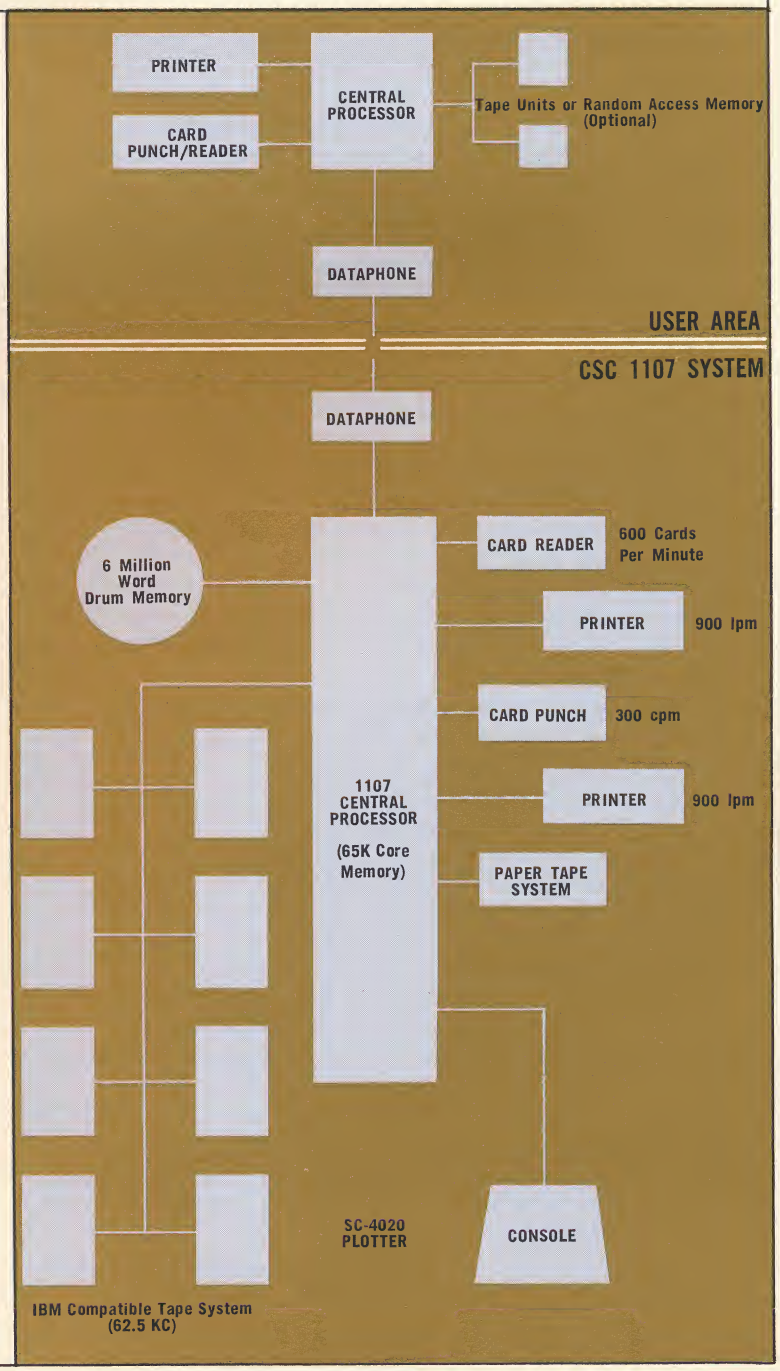
CSC's Service Bureau is the first in the nation to have pioneered and perfected a remote, on line communication system providing customers throughout the country with the speed and efficiency of the company's $3.3-million 1107 computer. The advantages of remote data processing at CSC have been realized by such companies as Signal Oil and Gas, and Rohr Corporation. Problem solutions are now available from CSC's Houston Division and at various customer locations within minutes after data is sent to Los Angeles via telephone lines.

Supported by a large staff of programmers, analysts and operations personnel, complete service at CSC is available, around the clock, seven days a week on an hourly or per-job basis. The CSC 1107 computer system includes:

- Central computer (core memory of 65,536 words)
- Eight magnetic drums (6,291,456 words, 360,000 characters per second transfer rate, 17 millisecond access time); available to FORTRAN users through buffered subroutines
- Complete array of peripheral equipment including eight magnetic tape units (62.5KC, compatible with the IBM 729); two line printers (900 lpm); card reader (600 cpm); card punch (300 cpm); and paper tape (5, 6, 7 or 8 level tape; read 400 frames per second; punch 110 frames per second)
- Sixteen bi-directional input/output channels
- Complete EAM punched card equipment

Features of CSC programs on the 1107 system, rated as the industry's fastest and most efficient system, include:

- FORTRAN IV which compiles up to nine times faster and permits execution of object programs up to two times faster than competitive systems
- A monitor system which permits multi-programmed control of input/output record equipment
- A complete library which is maintained on drums, thus freeing all tape units for problem solution
- The 1107 linear programming system provides up to 2,047 rows and an unlimited number of columns, affording users dynamic control during problem solution



FACILITY MANAGEMENT

The professional staff at CSC includes former managers and supervisors of many of the nation's largest computing centers in both the business and scientific fields. Management experience encompasses the selection of equipment, choice of facilities, and installation of computer systems, as well as recruiting and training of qualified personnel.

Since CSC is a company successfully operating its own large scale computer center, and providing programming support for virtually every major computer manufacturer, the staff is comprised of individuals competent in all aspects of computer facility management. Available for the operation of a computer facility are CSC mathematicians, engineers, programmers (systems, scientific and business data processing), computer operators, keypunch and tabulating machine operators, operations supervisors, tabulating supervisors, dispatchers, scheduling clerks, tape librarians, etc.

To efficiently and economically manage and operate a computer facility, CSC provides:

- An experienced management and operations staff
- A veteran programming staff competent in all aspects of scientific and data processing problem solution
- The independence of a service organization which can act as an unbiased consultant in the procurement of the most economical and efficient computing equipment
- Proven capability in the recruiting of professional personnel
- Experience in training programmers and operating personnel
- The resources of CSC's fully staffed, large scale computer center

The experience of CSC personnel includes management and group supervision at such major computing facilities as North American Aviation, IBM Service Bureau, Jet Propulsion Laboratory, Ling-Temco-Vought, United Aircraft, Space Technology Laboratories, Aerospace, Aerojet-General Corporation, Los Alamos Scientific Laboratory, Philco, Land-Air Corp., Kaiser Industries, and General Electric Co.

COMPUTAX

COMPUTAX, a new CSC service for the preparation of Federal and State income tax returns by computer, is now available to accountants in major population centers throughout the country.

COMPUTAX provides complete returns with CSC computers performing all necessary calculations from basic data furnished by the accountant. Features of COMPUTAX include:

- All required schedules and a transmittal letter with filing instructions, are produced for each return
- Completed returns are available within 48 hours after receiving the basic tax data from the accountant
- With each return, a diagnostic report is produced indicating problem areas and more advantageous methods of calculating the return
- Input forms designed by CSC for the accountant simplify the gathering of information
- There are no lower or upper limits on the number of returns which may be processed at any time
- All calculations and forms submitted conform to IRS regulations

COMPUTAX has been proven in test runs of more than 43,000 individual Federal and State returns for 1963 and has been reported in *Business Week, Wall Street Journal* and *The Journal of Accountancy*. All phases of the CSC COMPUTAX program related to technical tax requirements have been thoroughly reviewed by a leading national Certified Public Accounting firm.

In 1965, more than 1,400 accountants used COMPUTAX for 500,000 Federal and State returns. The COMPUTAX service has been programmed to handle virtually any individual return regardless of the degree of complexity. Principal advantages of the COMPUTAX service are to reduce the accountant's time in performing routine clerical tasks and to assure maximum accuracy, neatness and speed in the preparation of returns.

PROJECT MANAGEMENT

QUALITY ASSURANCE

CSC's Quality Assurance Department is responsible for the development and application of project management techniques for the improvement of product quality, timeliness and cost in all aspects of the company's operations.

CSC firmly believes that quality must be planned and designed into a system or program at the formative phase of a project as well as during implementation, checkout and testing. Application of accepted statistical and mathematical methods such as bar charts and PERT scheduling have proven instrumental in the punctual delivery of both small and complex programming systems. It is the responsibility of Quality Assurance to apply these procedures as well as the development and monitoring of a comprehensive test policy for each project undertaken at CSC.

Quality Assurance at CSC provides:

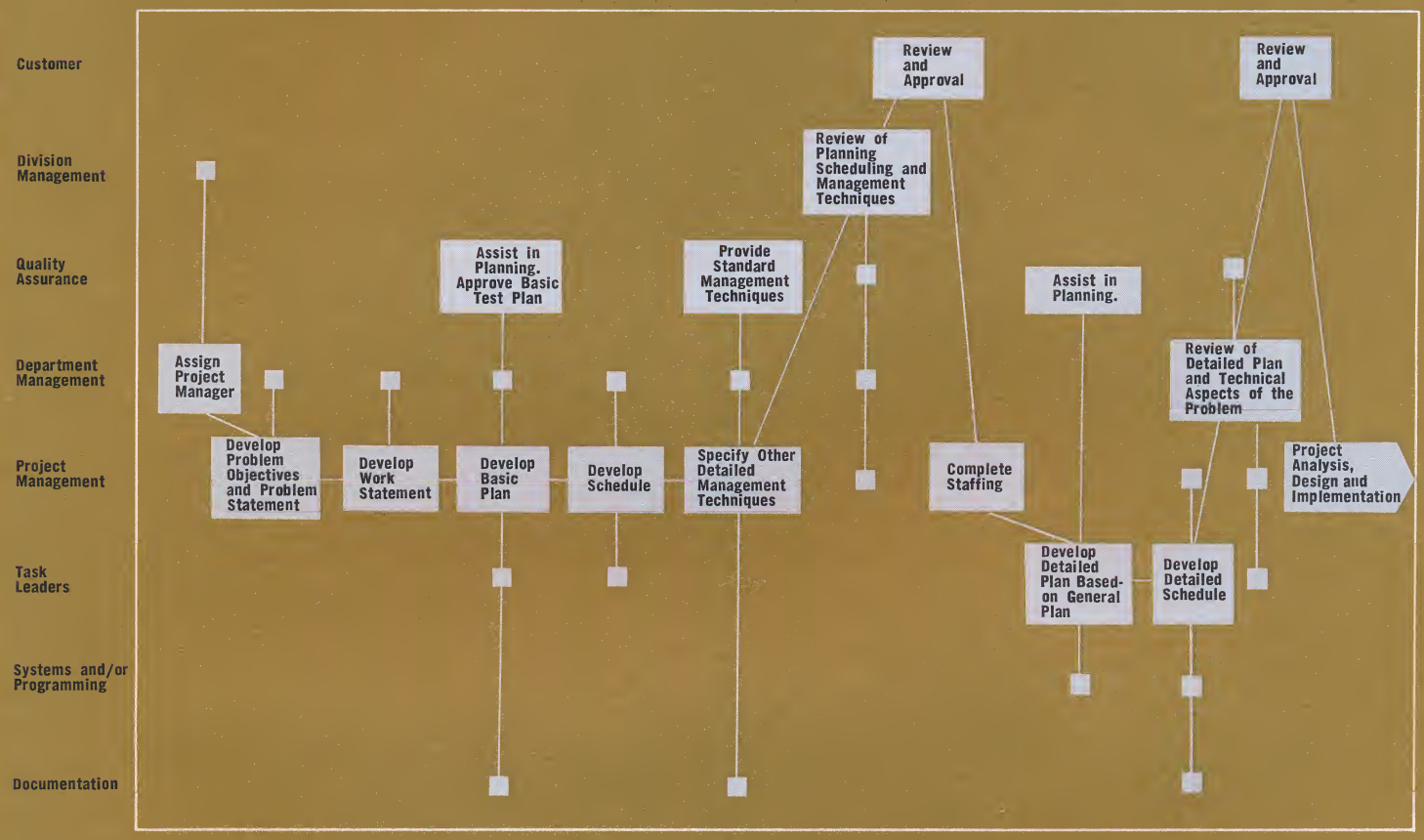
- Assistance to project management in all phases of design, development and checkout
- Development of planning and scheduling techniques
- Monitoring all project schedules
- Development and monitoring of a comprehensive product test policy
- Development and implementation of standards, procedures and communication aids
- Direct liaison with management

Quality Assurance is also responsible for documentation standards at CSC including technical writing and technical publications groups. Excellence of documentation in all phases of problem analysis, design, and programming is stressed at CSC, and a policy of maintaining standards for effective communication are important functions of Quality Assurance.

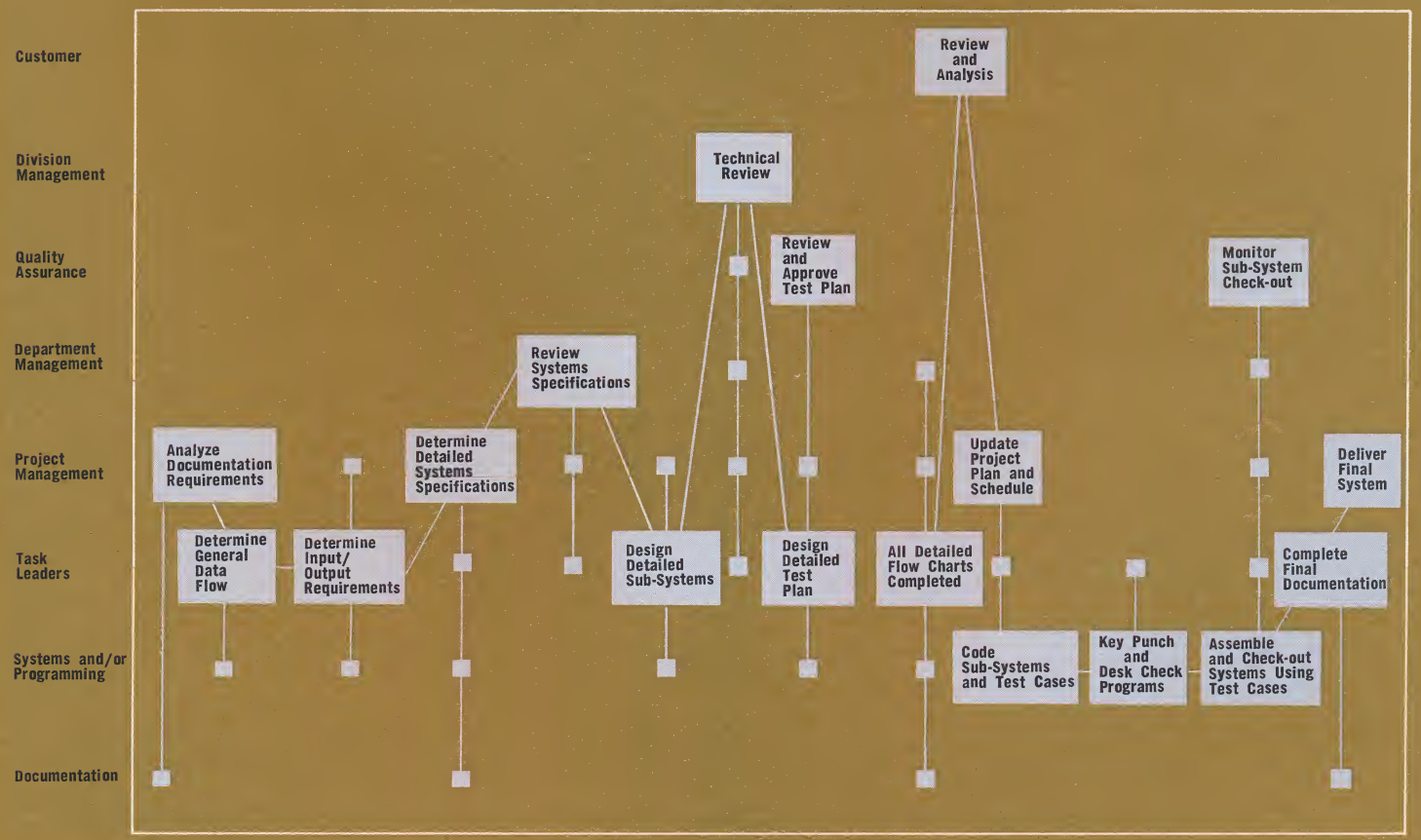
The Quality Assurance Department is staffed by senior managerial personnel whose experience includes management of computing facilities and large programming projects. Quality Assurance Department reports directly to CSC management summarizing project progress to assure the customer of immediate responsiveness to project requirements.

PROJECT PLANNING

PROBLEM DEFINITION AND PLANNING



ANALYSIS, DESIGN AND IMPLEMENTATION



CLIENTS AT CSC

Quality of performance in the computer sciences may be reflected by the impressive stature of the companies, government, and military agencies who have found it profitable to repetitively select the services of Computer Sciences Corporation. A few of the many distinguished firms included among CSC's clients:

AC Spark Plug • AiResearch • Applications Research • Astrodata • Autonetics • Beckman Instruments • City of Long Beach • Control Data Corporation • Cubic • Curtiss-Wright • Daystrom • Del Webb • Douglas Aircraft • Edgerton, Germeshausen & Grier • Electronic Communications • Electronic Specialty • Garrett • General Dynamics • General Electric • General Motors • General Precision Industries • Great American Insurance • Hughes Aircraft • International Business Machines • Jet Propulsion Laboratory • Kaiser Aluminum & Chemical • Lear-Siegler • Librascope • Litton Industries • Lockheed Aircraft • Lockheed Missiles & Space • Joseph Magnin • Milgo Electronic • Honeywell • Monroe Calculating Machine • Motorola • National Aeronautics and Space Administration • North American Aviation • Northrop • Parker Aircraft • Philco • Radio Corporation of America • Raytheon • Renault • Rohr Corporation • Sandia Corporation • Signal Oil and Gas • Southwest Savings Association • Sperry Rand • Southern California Edison • Standard Oil of New Jersey • State of California • Teledyne Systems • Telemetrics • Thompson Ramo Wooldridge • Union Carbide • Union Oil • United Aircraft • United States Air Force • United States Army • United States Navy • University of Arizona.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CSC
jpl
RCA
TRW
GD
Beckman
ISi
SPERRY
GARRETT
LOCKHEED
RAYTHEON

NEW YORK

WASHINGTON, D.C.

SAN FRANCISCO

CSC FACILITIES

LOS ANGELES
650 North Sepulveda Boulevard
El Segundo, California
678-0592

NEW YORK
660 Madison Avenue
New York, New York
PL 2-6885

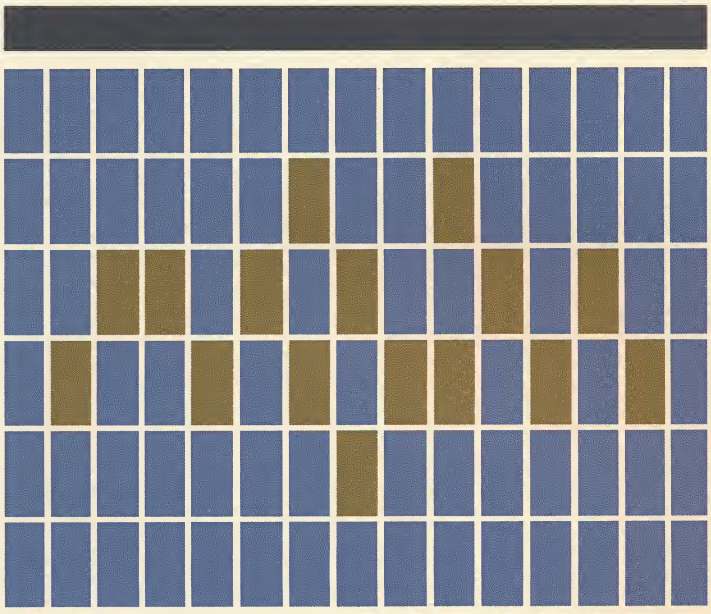
WASHINGTON, D. C.
8121 Georgia Avenue
Silver Spring, Maryland
588-8538

HOUSTON
3773 Richmond Avenue
Houston 27, Texas
MO 6-0896

SAN FRANCISCO
960 North San Antonio Road
Los Altos, California
DA 6-3540

LONDON
112 Chatsworth Court
Pembroke Road
London, W.8, England
WES 8406

HOUSTON



Design: James Brooks